AMENDED SPECIFICATION.

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PATENT SPECIFICATION

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Complete Accepted: Aug. 11, 1932.

COMPLETE SPECIFICATION (AMENDED).

Improvements in and relating to Sutures for Surgical and other Needles.

I, ERNEST HENRY LYDEARD, a British subject, of Randwick, Plymouth Road, Redditch, in the County of Worcester, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

This invention relates to sutures for surgical and other needles.

There is upon the market a type of eyeless surgical needle in which a single thread suture is irremovably secured in the tubular end of the needle. This form of needle and suture has the technical advantage that the junction of the needle with its suture avoids the usual double thread thickness found in threaded needles and offers little or no resistance or obstruction to its smooth passage through tissues or membranes. Although this unitary needle and suture is very successful and approved by surgeons it is, nevertheless, somewhat expensive as when once a needle has been employed it cannot be used again but must be discarded as there is no means of replacing the old suture by a new one; consequently, a fresh needle with its attached suture has to be employed for every operation however small.

The object of the present invention is to remove the above disadvantage and provide a form of suture and mode of securing such to a needle whereby sutures can be attached to their needles and removed therefrom at will while at the same time providing a junction which offers little or no resistance or obstruction to its smooth penetration through tissues or membranes, or, in other words, affords sewing facilities substantially equal to those of eyeless needles with permanently attached suture.

The invention consists in providing sutures with eyes adapted to be engaged or temporarily secured in self threading spring eyed needles. By the term "suture eye" is meant a closed eye as distinguished from a suture terminal spring or other hook for attachment to a needle and includes both a hole or aperture extending from side to side and opposed sockets or recesses separated from one another by a thin web or partition. According to the invention sutures are formed each with an eyed end or an eyed link or ferrule permanently secured to the suture end and adapted to be engaged or temporarily interlocked in the eye of a self-threading or spring-eyed needle of known form per se.

The invention comprises an improved mode of securing a suture to a self-threading or spring-eyed needle, which consists in detachably engaging the eyed suture end between the spring shoulders of the needle so that the shoulders meet or close in the eye aperture or recess, in contradistinction to locating the suture in the eye of the needle below the spring shoulders.

The invention also consists in a method of manufacturing suture eyes or eyed links or ferrules, for fixing to one end of the suture, on the one hand, and detachably securing to a self-threading or spring-eyed needle on the other.

The links are preferably of metal but may be of any suitable material such for example as one of the appropriate mouldable compositions, for example, the links may be moulded from the composition known by the Registered Trade Mark "Bakelite".

The eyes (holes or sockets) may be circular, rectangular, triangular or any other desired shape.

In the accompanying drawings:—

Figure 1 is an enlarged front elevation of an eyed suture link or ferrule according to one form of the invention.

[*Price* 1/-]

Figure 2 is a side elevation according to Figure 1, and

Figure 3 shows the ferrule illustrated in Figures 1 and 2 attached to a fragment of a suture.

Figure 4 is a diagrammatic enlarged side elevation intended to illustrate one suitable method of forming links or ferrules as seen in Figures 1, 2 and 3.

Figure 5 is an enlarged side elevation showing a modified form of construction of an eyed suture link or ferrule according to the invention, while

Figures 6 and 7 show the independent parts of the link or ferrule shown assembled in Figure 5.

Figures 8 and 9 are fragmentary enlarged side elevations illustrating modified constructions of link or ferrule according to the invention.

Figures 10 and 11 show enlarged perspective views of a known form of self-threading or spring-eyed needle suitable for use in conjunction with ferrules of the proportions indicated in the other figures.

Figure 12 shows a ferrule or link (with its attached suture) as illustrated in Figure 3 detachably secured, according to a feature of the invention, to a self-threading needle (as shown in Figure 10).

Figure 13 is an enlarged fragmentary section illustrating socket eyes in a link instead of the through eye hole.

In carrying the invention into effect according to one convenient mode for the production of eyed links or ferrules for sutures, as illustrated in Figures 1, 2 and 3, a suitable length of metal tube 1 of appropriate diameter and preferably of silver or non-corrosive metal, is flattened (see Figure 4) at points separated by double the length required for a link or ferrule. The flattened portion 2 is bored or stamped to form eyes at two places as indicated by the arrows 3 and is then severed on the lines 4 and 5, the severance at 4 being a straight cut while at 5 the tube may be sheared so as to give each portion a rounded or radiussed end contour substantially parallel with the outer semicircular portion of the eye hole, as seen in Figure 1.

The link or ferrule thus formed comprises a sleeve or tubular socket 1*a* terminating in a flattened portion 2*a* having an eye 3*a* which, as will be seen, is located as close to the rounded end 5*a* as is consistent with strength. The flattening process in the region 2 (see Figure 4) is also adapted to afford smooth curving shoulders 6 so as to offer no obstruction to the passage through a tissue or membrane in the sewing direction.

The suture is introduced into the socket 1*a* and secured by an indented annulus 7 or by crimping or otherwise deforming the socket in such a way as to pinch the suture 8 without unduly roughening the surface of the socket.

In carrying the invention into effect according to another mode, suitable tubes (such as seen in Figure 7) are cut to the required length and tubular or solid pieces (see Figure 6) having a barrel portion 1*b* and a flattened portion 2*a* are formed with eye holes 3*a*. The barrel portion may be formed with a roughened or serrated area 9 and with shoulder at 6 as already described in reference to Figure 2. The unit shown in Figure 6 is introduced into the end of a tube 1*a* (Figure 7) and a junction is made by crimping or clamping pressure or by spinning down the end of the tube as at 10 upon the roughened part 9 of the barrel 1*a*. The suture is introduced into the open end of the tube 1*a* and crimped or provided with an indented annulus as at 7.

According to another modification a tubular element 1*a* (see Figure 8) has introduced into its end a loop 3*a* of rustless steel, silver or other wire which is secured in position by crimping the end of the tube as at 11 thereon.

In carrying the invention into effect according to another convenient mode, a split tubular socket 1*b* (as seen in Figure 9) is formed and closed upon the suture in any suitable manner as, for example, substantially according to the mode described in British Letters Patent No. 288,425 with reference to eyeless needles and is also provided with a flattened piece or extension 2*a* which is provided with an eye hole 3*a*. In this form, as in those previously described, it is preferred to make the tubular portion with a curved shoulder 6 and in this connection it is pointed out that in the form shown in Figure 1 the shoulder may be of annular form instead of upon each side as shown in Figure 2.

It will be understood that the customary way of introducing a suture into a self-threading or spring-eyed needle (as shown in Figure 10 or 11) is to lay the running end of the suture across the V-shaped end 12 of the needle and force it between the spring-pressed shoulders 13 into the eye 14 of the needle. It will be understood that according to this mode, when the needle is threaded there is a double thickness of suture or thread at the needle eye in the ordinary way.

The improved suture is attached to the needle, according to the invention, by introducing the rounded edge of the flattened portion 2*a* of the ferrule or eyed

link into the V-shaped cavity 12 and pressing downwards between the spring shoulders so that the latter snap into the eye 3*a* of the ferrule, in which position it will be seen that the shoulders meet together or close in the eye 3*a* and that the suture is thereby firmly yet detachably secured or locked in position. The suture may be released by turning its ferrule through a right-angle (out of the plane of the paper as seen in Figure 12) so that it moves about the meeting shoulders 13 as on a pivot. The ferrule is then pressed downwardly causing the upper side of the aperture 3*a* to bear upon the V-shaped incline of the shoulders, forcing them to open and allow the ferrule eye to pass between the shoulders 13 downwardly and thus be released.

In any of the forms of the invention above described instead of making the suture or link eyes as throughway apertures or holes they may be formed as shown in Figure 13 in which a pair of opposed or back to back sockets or recesses 3*b* are stamped or impressed in the link. These sockets or recesses are engaged in the needle between the shoulders 13 in the same way as the throughway eyes are, with the exception that the shoulders 13 will not meet but will be separated by and close upon the web or partition 3*c*.

If desired, instead of attaching the sutures to needles in the manner indicated, a pair of forceps or other instrument may be utilised in the eye of the needle to open the spring shoulders so that the eyed ferrule is introduced or engaged between the shoulders after which the forceps or other instrument is withdrawn.

The outside diameter of the ferrules or links as described above, may be made less than that of the needle, particularly with regard to the larger sizes of needle, but ferrules of larger diameters than the needles may be employed as the sloping shoulders of the ferrule afford a lead or smooth entrance in passing through a membrane or tissue.

The sutures employed according to the invention may be of catgut, silk, linen thread, silkworm gut, Japanese gut or the like. Furthermore, silver wire or other metal sutures may be employed in which case the end of a wire may be clamped in a ferrule of any of the forms above described or, alternatively, the end of the wire itself may be provided with an eye hole or sockets as, for example, by flattening the wire at the end and rounding it, if desired, and piercing or drilling an eye hole or stamping eye sockets or recesses of appropriate diameter, thus forming an integral eyeletted suture.

The invention may be supplied to the trade in the form of eyed sutures or sutures having eyed ferrules or links secured thereto, or eyed ferrules or ferrules with wire loops may be supplied alone for attachment by the surgeon or operator to sutures as required. For this purpose the sutures are inserted in the tubular sockets of the ferrules which are clamped upon the suture by the use of a pair of pliers or other appliance which may be specially formed with a pair of semicircular dies for the purpose, or may be otherwise provided with dies for crimping or pressing the ferrule on to the suture end. Where a link as shown in Figure 9 is employed pliers having jaws suitable for closing the lips of the slot or slit upon the suture in the ferrule, may be employed.

It is pointed out that self-threading needles (see Figures 10 and 11) having the shoulder and V notch proportions as illustrated, are recommended for use in conjunction with eyed ferrules as shown in the other figures but where needles having deeper notches and shoulders are to be employed changes in dimensions should be made in the eyed ferrules to suit.

It will be appreciated that the invention is primarily concerned with the provision of sutures for surgical needles but sutures or sewing threads for other purposes (where the features of the invention would be advantageous and suitable) may according to the invention be provided with eyed links or eyed ends for attaching to spring-eyed needles if desired.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is:—

1. A suture for self-threading or spring-eyed surgical or other needles, having an eye at its end for engaging in the eyed end of the needle.

2. A suture for self-threading or spring-eyed surgical or other needles, terminating in a flattened portion having an eye therein for engaging the eyed end of the needle.

3. A suture for self-threading or spring-eyed surgical or other needles, provided with a link or ferrule having an eye or loop for engaging the eyed end of the needle.

4. A suture for self-threading or spring-eyed surgical or other needles, the end of which is fixed in a tubular link or ferrule provided with a flattened

portion or extension enclosing an eye for engaging the eyed end of the needle and having a curved shoulder portion adjoining the flattened part.

5. A suture for self-threading or spring-eyed surgical or other needles, the end of which is fixed in a tubular link or ferrule provided with a flattened portion or extension enclosing an eye for engaging the eyed end of the needle and having a rounded or radiused end substantially parallel with the outer semicircular portion of the eye.

6. A suture for self-threading or spring-eyed surgical or other needles, having a link or ferrule comprising a tubular portion fixed at one end to the suture and secured at the other end to a separate eyeletted piece or wire loop.

7. A link or ferrule for securing a suture to a self-threading or spring-eyed surgical or other needle comprising a part to which a suture is securable and a portion formed with an eye or loop adapted to engage in the eyed end of the needle.

8. A link or ferrule for securing a suture to a self-threading or spring-eyed surgical or other needle comprising a tubular part in which the end of the suture is securable and a flattened part formed with an eye, or a wire loop or separate eyed piece secured in the tubular part, for engaging the eyed end of the needle.

9. Securing a suture having the features claimed in Claim 1 or 3 to a self-threading or spring-eyed surgical or other needle, by engaging the suture eye or eye of the link or ferrule thereon between the spring shoulders of the self-threading or spring-eyed needle, so that the shoulders close within the suture eye, see for example Figure 12.

10. A single-threaded suture in combination with a surgical or other needle wherein the suture and needle are detachably connected together by the engagement of an eye upon the one with the spring shoulders of the other.

11. A method of manufacturing eyed links or ferrules for sutures for self-threading or spring-eyed surgical or other needles, consisting in flattening portions of a tube at intervals spaced apart double the length of the ferrule or link, forming eyes in each flattened portion and severing the tubular parts midway between the flattened parts and the flattened parts between the eyes therein.

12. A single-threaded suture for a self-threading or spring-eyed surgical or other needle having a link or ferrule substantially as described with reference to the accompanying drawings.

13. A link or ferrule for securing to a suture for a self-threading or spring-eyed surgical or other needle substantially as described with reference to the accompanying drawings.

Dated this 30th day of November, 1931.
MARKS & CLERK.

Redhill: Printed for His Majesty's Stationery Office. by Love & Malcomson, Ltd.—1934.

[This Drawing is a reproduction of the Original on a reduced scale.]

Fig.1

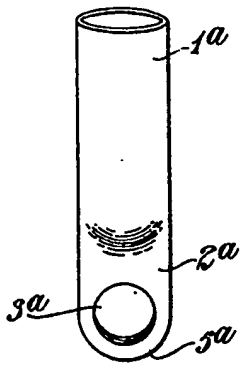
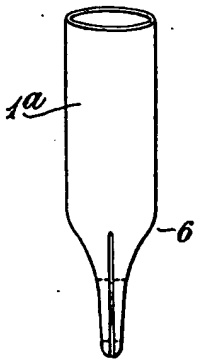


Fig.2



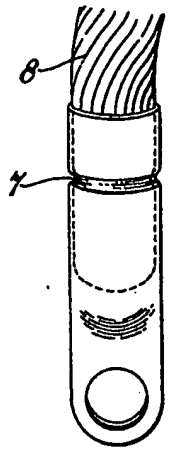


Fig.3

Fig.4

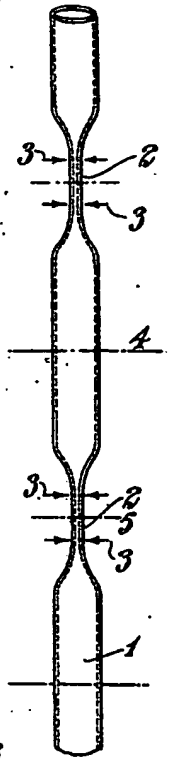


Fig.7

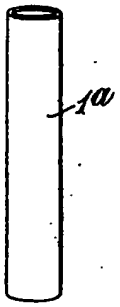
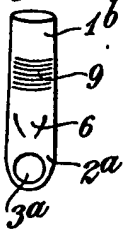


Fig.6



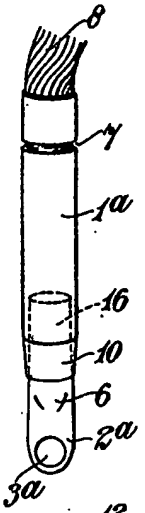


Fig.5

Fig.8

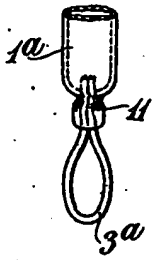
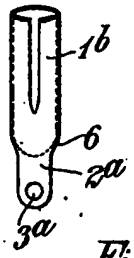


Fig.9



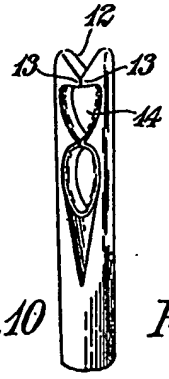


Fig.10

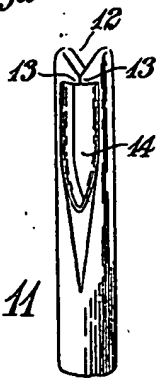
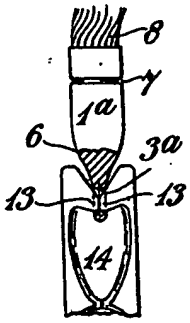


Fig.11

Fig.12



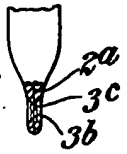


Fig.13

Malby & Sons, Photo-Litho.